

The background of the entire page is a composite image. It features an aerial night view of a city, likely New York City, with illuminated buildings and streets. Overlaid on this is a network of glowing blue lines and nodes, resembling a fiber-optic or 5G network. The lines are more prominent in the upper left and right sections. The title text is centered in a dark green, semi-transparent rectangular area.

5G AND THE NEW RULES OF WIRELESS

5G and the New Rules of Wireless

Nowadays, we hear a lot about 5G, otherwise known as the fifth-generation of wireless technology.

It is depicted as the route to the internet of things (IoT), autonomous automobiles, internet virtual reality (VR), battlefield artificial intelligence (AI), and new security models.

Advisor to the Trump Administration General Robert Spalding wrote a memo warning:

"If the Chinese dominate 5G, what lies ahead is mayhem and mass surveillance."

Spalding will soon publish a book entitled *How China Took Over While the US Elite Slept*. He declares:

"China gains at the expense of democracies everywhere."

Spalding's influence is all over the Trump Administration, and his jeremiads about the Chinese and 5G are widespread on YouTube.

I don't think he understands the details or the implications of 5G or the nature of the "threat," which comes not from China but green Luddites in the United States.

The Real Threat to 5G

In March 1993, I wrote an essay for *ForbesASAP*, technology supplement of *Forbes* magazine that I helped start with Rich Karlgaard, *Forbes* publisher.

In it, I expounded the "New Rules of Wireless," arguably predicting the iPhone. *"As portable as your watch and as personal as your wallet, it will recognize speech and navigate streets, collect your news and your mail"* and so forth. But more importantly, I predicted the essentials of 5G.

For all the talk about spectrum allocations and machinations, there is only one crucial issue in wireless and 5G. That is whether the US continues to allocate exclusive bands of spectrum to the winners of auctions.

If Spalding wants something to complain about, these spectrum auctions impose a major tax, now totaling close to \$150 billion, on US telecom that is not exacted in China. It reserves the next generation for the incumbent leviathans with obsolescent technology and suppresses entrepreneurial progress and invention in the field.

The result is an obsessive drive by companies such as AT&T and Verizon to harvest the existing spectrum by "going Hollywood" and producing "content," as if anyone would choose phone companies to make their movies.

To play in the auctions, for example, AT&T sold off its Western Electric telecom equipment operations, leaving the field to Huawei and other foreign manufacturers. Verizon bought the *Huffington Post* as if you want to get your news from a phone company.

In my article in 1993 and prior speeches, I predicted that in the future most connections would migrate to the unlicensed bands of the spectrum that are not subject to auction and exclusive use.

Called the ISM bands for industrial, scientific and medical applications, these unlicensed bands also accommodate Wi-Fi. Today, perhaps half of all phone and data calls did not go through the licensed bands of spectrum but the ISM channels such as Wi-Fi.

Spectrum is in any way naturally scarce — "resembling beachfront property" in the FCC auctioneering spiel. The industry would move "up spectrum" toward the boundless realms of microwave and even infra-red. Steady improvement of their mastery of "smart radios" and software-defined radios will allow users everywhere to share the spectrum as they do in Wi-Fi.

This incidentally was the view of David Medved, the late physicist father of Israeli venture capitalist Jonathan and US talk-show host Michael whom I am accompanying on a tour through Israel this week.

The crucial issue in 5G is whether enough unlicensed spectrum is reserved so that the massive move away from the auctioned spectrum continues. The most important allocations of this spectrum come not through the auctions but the allocation of bands up to 300 gigahertz microwaves and even infrared.

Make Way for David Medved

David Medved was a veteran of fiber optic companies that use infrared light in crystalline silica strands that would be so long and so pure you could see through 40 miles of it.

His company Jolt used similar infrared through the air for campus and building to building links. He also explored the use of ultraviolet light for battlefield communications.

So how did I become a “MedHead”?

And what does it have to do with 5G?

MedHead is not a moniker for fans of physicians or producers of medical instruments or addicts of exotic medicines.

It is the name used by the millions of followers of Michael Medved’s daily talk-show, now being broadcasted from Israel during our joint Discovery Institute tour.

But I did not become a MedHead because of Michael, who I knew at the time only as a scintillating critic of Hollywood movies.

Nor was it because of Jonathan, his creative Israeli venture capitalist brother who helped propel the Israeli economy to its present eminence in high technology. Jon’s most recent venture, called “Our Crowd,” made \$200 million in investments in Israeli technology in 2018 and became the world’s leading “crowd-funding” success.

Jon Medved recently ended an interview on the chief lesson of his life:

“Life is very, very short. I look toward my next thirty years and I hope that I will be able to dance at many of my grandchildren’s weddings, to drink a lot of good whiskey with friends on weekends, to sit on the beach and fish, and simultaneously to find investors for new initiatives” in new Israeli technology projects.

I learned about as many as 20 of these fantastic projects when I interviewed him this morning — everything from zapping cancer tumors with lasers to putting a \$2 million mass spectrometer for molecular chemistry on a single chip.

But Jonathan did not make me a MedHead. I became a MedHead because before I met either Michael or Jonathan, I read a paper by their physicist father David Medved on the electromagnetic spectrum.

The Emergence of the Spectrum

David Medved — like me — was a spectrum maximalist and cornucopian.

He denied the usual depictions of the airwaves as resembling “beachfront property.” David did not imagine that spectrum is a scarce resource that would have to be husbanded by government and sold off at auctions to the highest bidders.

Beginning with a fiber optics company that he sold off to MRV, using the 1550 nanometer wavelength, he knew that it was possible to manipulate the spectrum and find its best uses. With new microchips and other devices, engineers developed erbium-doped amplifiers to boost the signal and “software-radios” to manipulate it.

In fiber optics, the industry moved to the 1550 nanometer band because it combined low attenuation and low absorption and enabled convenient lasers. But fiber optics only uses an infinitesimal span of waves.

The electromagnetic spectrum runs from terahertz gamma rays at 10 to the 21 only picometers wide to radio waves in the kilohertz the size of football fields. Below that, there are even low-frequency pulses used to contact submarines through the water for scores of miles.

Today some fear-mongers suggest that 5G high frequencies pose a health threat. But as David Medved told me years ago, if you expose yourself to the sun, you receive far more radiative energy than is emitted by infrared or microwave spectrum. Any airplane pilot receives vastly more high energy radiation than anyone near a 5G cell tower.

Visible light from the sun will damage your eyes if you stare into it. Therefore, the government imposes a SAR (specific absorption rate) that prevents the use of visible light and contiguous frequencies that affect your eyes.

These requirements affect many industries beyond cell phones. SAR means that most LIDAR (light detecting and ranging systems) for vision in self-driving cars have to operate at low power. This both limits their reach

and expands the number of transceivers needed to 64 or 128 on each car.

Austin Russell of Luminar Corporation (one of my investments through the 1517 Fund of Peter Thiel) has achieved a breakthrough by moving up spectrum to the same 1550 nanometer wavelengths that David Medved used in fiber optics.

These wavelengths do not affect the eyes. But they give more powerful and effective vision systems for self-driving. Luminar's technology is now being tested by much of the automotive industry.

Rather than depending on maps, cloud computing, and artificial intelligence to drive the car from afar, Russell's technology enables the car to see objects hundreds of yards in front of the vehicle. Granting the self-driving apparatus as long as seven to 10 seconds to apprehend and interpret the scene, Luminar promises sharply to improve the safety and effectiveness of self-driving vehicles.

Self-driving vehicles may ultimately prove to be a use of spectrum as significant as 5G. As China shows, without a \$150 billion auction tax, people can innovate more readily in the use of spectrum.

Rather than a chimerical campaign against Huawei for taking the lead in 5G, perhaps the US should stop taxing and stultifying its telecom companies.

We should come to terms with the fact that the spectrum is not limited; it is essentially infinite. The allocation of specific bands is decelerating the advance of software-defined smart radios that can survey the spectrum and send signals to unused air.

The chief threat of 5G to the US is not China but our regulators who are intoxicated by auction revenues and are stultifying American telecom.

The move to unlicensed bands will continue under 5G and the auctions will end.

I share the ideas found in this exclusive report along with many other thoughts and paradigms in my newsletter, *The George Gilder Report*.

I've been told that I have an uncanny ability to predict technology megatrends years before they became mainstream news — along with the companies best positioned to benefit.

My monthly newsletter is dedicated to uncovering these little-known investment opportunities that are tied to emerging technology trends.

And *The George Gilder Report* is the only place in the world to receive my insights and ideas on an ongoing basis.

Call 1-800-796-1913 for more details.

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